

Earth Structures and Processes Teacher Notes

Structure	Important tidbits for class conversation from Pen Pal Letters LS 1.4	Physical form descriptions from 3 sources: Pen Pal letters, <i>My World</i> , and Topography Maps LS 2.3	Suggested Earthquake data pattern in <i>My World</i> LS 5.6	Suggested Volcano Data Pattern in <i>My World</i> LS 6.5	Suggested volcano pattern in relation to earthquake pattern and topography LS 7.1	Suggested Depth Data Pattern in <i>My World</i> LS 7.5	Suggested Volcano Type Pattern from 2 sources: <i>My World</i> and Pen Pal Letters LS 7.6
Aleutian Islands	<ul style="list-style-type: none"> String of islands resulting from volcanic activity Part of the Pacific Ring of Fire Coast is very jagged and rocky with steep cliffs and mountains Underwater eruptions form new landforms Many volcanoes are still active Earthquakes are common, become more frequent before and eruption 	<ul style="list-style-type: none"> Islands an extension of Alaskan Peninsula, sort of like a bridge between Asia and North America Four main islands in a curved line Coasts are jagged and rocky; most of the coastlines are lined with steep cliffs and mountains; there is deep ocean all along the islands. Very low in elevation in the North; just barely sticking out of the water Just south of the islands the land is very deep 	Narrow band of West-East earthquakes on the edge of the mainland and along the string of islands; mostly underwater. There is one clear regional pattern. The earth structure is near the edge of the plate boundary.	A narrow line of volcanoes. There are lots of volcanoes in this region.	A narrow line of volcanic islands and mountains parallel to a narrow band of earthquakes. Some of the volcanoes are on the land and others are under the water. There is one pattern in the region.	Many deep earthquakes showing a pattern of shallow to deep	<ul style="list-style-type: none"> Strong pattern of strato-volcanoes following the chain of islands Underwater volcanic eruptions Many volcanoes are still active

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Baja Peninsula	<ul style="list-style-type: none"> A few active volcanoes; there are some underwater volcanoes Earthquakes under water. Long and narrow peninsula that looks like it is detaching itself from the coast of Mexico Area is made up of mostly flat dessert. Mountains are not jagged but rather flat. 	<ul style="list-style-type: none"> Different types of mountains; Most mountains are not jagged but rather flat and not very tall. Long and narrow peninsula 	There is a broad line of earthquakes following the coast of Mexico in the Sea of Cortez at the peninsula. Farther north in California the earthquakes are on the land and more scattered. There is a different regional pattern in the north than the south. The earth structure is near the edge of the plate boundary.	Scattered volcano pattern. There are many volcanoes in this region but they are scattered. Some are on land, and from the pen pal letter students should recall that there are volcanoes under the water as well.	Near the peninsula there are few volcanoes scattered on one side of the narrow line of earthquakes. In the north part of the region, California, the volcanoes seem scattered without a clear earthquake pattern. Mountains are volcanic but are rather flat and short.	Very few deep earthquakes	<p>Quiet eruptions (under water)</p> <p>No real pattern</p>
Hawaiian Islands	<ul style="list-style-type: none"> Kilauea is one of the most active volcanoes in the world. Islands are a chain of active volcanoes. Lava can move 35 mph. Hawaiian volcanoes are not dangerous. Lava usually flows slowly. Some vents flow directly into the ocean 50 acres of new land are created each year. 90% of the surface of the Big Island of Hawaii is covered by lava less than 1000 years old. Island moves 12 cm (5 in.) per year. 	<ul style="list-style-type: none"> String of islands in the middle of the ocean. Lots of land under the sea with tip of mountain peeking out of the water (island); low land elevations surrounded by pretty deep water Line of islands stretches from north to south Hawaiian islands are the tops of mountains that extend to the ocean floor 	Clustered in one spot on one island in the center of the region. The Hawaiian Islands are far away from the edge of the plate boundaries.	Lots of volcanoes in one spot that seem to follow the island chain but do not continue.	A cluster of volcanic activity near the islands but far away from the plate boundaries. Few earthquakes; probably related to volcanic activity. Volcanic island in the middle of a large plate.	No deep volcanoes	<p>Quiet Eruptions- comes out quietly or spouts like a fountain</p> <p>All shield volcanoes</p>

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Iceland	<ul style="list-style-type: none"> • A relatively new island • Has Europe's largest glacier • Many active volcanoes: most volcanoes erupt under ice • Fire and ice-results in mixtures of water, ice, and rocks flowing rapidly • Whole island is mostly made up of old lava flows--Land area added; new islands pop up quickly • Hot springs and geysers; sources of geothermal power • Along a rift • EQ occur almost daily; volcanic activity makes the land move and settle 	<ul style="list-style-type: none"> • Island sitting in a rift. (Island formed BY rifting) • Not very high in elevation 	There is a curvy narrow band of earthquakes. Iceland falls on this regional line of earthquakes. There are more earthquakes in the water than on land. Iceland is on the plate boundary.	<p>On the island of Iceland there are lots of scattered volcanoes.</p> <p>For the rest of the patterns students should really look larger than the earth structure box. There is a scattered pattern of few volcanoes throughout the Mid-Atlantic Ocean.</p>	Volcanoes are clustered on the island. Throughout the rest of the region there is a scattering of few volcanoes on either side of a narrow line of earthquakes. Underwater volcanoes have been described in this region, giving birth to new islands. Iceland is a relatively flat island that gradually grows out of the ocean floor.	Very few deep earthquakes scattered within the earthquake pattern. Gradual pattern of deep to shallow not present.	<ul style="list-style-type: none"> • Mostly stratovolcanoes • Many active volcanoes that erupt mostly under ice

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Java Trench	<ul style="list-style-type: none"> Trench; deepest point of the Indian Ocean; steep mountains next to trench Volcanic eruptions trigger tsunamis Near volcano chain 	<ul style="list-style-type: none"> deep under water trench near steep mountains Next to trench are about 13,000 islands 	Narrow band of earthquakes; most earthquakes underwater off the southern coast of Indonesia; some earthquakes on the islands. There is a clear regional pattern. The earth structure is near the plate boundary.	There are lots of volcanoes in this region that follow the coast line of the islands in a narrow line.	There is a narrow line of volcanoes on the north-east side of a narrow band of earthquakes. The narrow band of islands and mountains are volcanic and sit next to a deep ocean trench. There is one pattern in the region of this earth structure.	There are deep earthquakes in the eastern data. Gradual pattern of deep to shallow earthquakes present.	<ul style="list-style-type: none"> Many stratovolcanoes 3 active volcanoes with small eruptions spitting out ash and steam There have been huge eruptions
Mariana Trench	<ul style="list-style-type: none"> Trench 11,033 meters below sea level (almost 8 Sears towers deep)—deepest point on Earth Frequent Volcanoes and EQ Volcanoes erupt both above ground and underwater Mariana Islands line up west of the trench Special life forms adapted to this deep part of the ocean More recent ideas from the Challenger Deep 	deep under water trench near steep mountains <ul style="list-style-type: none"> runs northeast to southwest like a deep underwater canyon 	Clear broad line of earthquakes in a hook-like N/S line. All earthquakes occur in the ocean. Further south the earthquakes are more scattered and less common. The earth structure is near the plate boundary.	There are lots of volcanoes in this region that follow the island chain in a narrow line. In the south part of the region there do not seem to be any volcanoes.	There are lots of volcanoes in this region that are parallel to and to one side of the narrow band of earthquakes. There is a narrow band of volcanoes that parallel these data patterns and a deep ocean trench. In the south both the earthquake and volcano patterns are more scattered and the topography is more gradual in change.	There are deep earthquakes in the western data. Gradual pattern of deep to shallow earthquakes present.	<ul style="list-style-type: none"> Most of the volcanoes are strato-volcanoes Northern islands are volcanic and younger than the others There are both above and below water volcanoes Frequent explosions

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Mount Aconcagua	<ul style="list-style-type: none"> Lots of active volcanoes and big and small earthquakes. Largest earthquake ever recorded. Largest mountain range in the world and the highest peak in the Western Hemisphere. Where the mountains meet the ocean there is a deep Trench next to high mountains. Earth structure is responsible for diverse climate/ vegetation/ ecosystems. Volcanoes cause mud flows 	<ul style="list-style-type: none"> Tall Steep (Jagged and pointy) mountains next to a deep trench Very high elevation with a steep drop off to the ocean on the west coast 	In a narrow band along the western edge of the continent; a broad pattern in the center region; mostly on land some in the water in a N/S direction; one clear pattern along coast. There is one regional pattern. The earthquakes happen throughout the Andes Mountain range. The earth structure is near the plate boundary .	There are lots of volcanoes along the west coast of South America that follow the coast in a narrow band. In the middle of this region there seems to be little or no volcanic activity.	There is a narrow line of lots of volcanoes to the east and parallel to a narrow band of earthquakes. A narrow band of steep mountains rise from a deep ocean trench. There seems to be one pattern along the coast of South America.	Deep earthquakes on continent side (East). Gradual pattern of deep earthquakes to shallow earthquakes present.	<ul style="list-style-type: none"> Clear north-south pattern of stratovolcanoes Explosive active volcanoes
Mount Cook	<ul style="list-style-type: none"> Lots of volcanic activity—over 400 volcanoes have been active in the past 10,000 years. Some volcanoes are dormant Stretch of active volcanoes in Northern Island 	<ul style="list-style-type: none"> Country made up of two main islands North Island has many volcanoes South Island is more mountainous with glaciers 	Earthquakes are in a narrow band in a S/NE direction. They are both in water and on the islands, traveling in a linear path through the islands. Earthquakes are more scattered and less frequent on and near the south island. The earth structure is near the plate boundary. .	On the north island there seems to be lots of volcanoes in a narrow line. On the south island there seems to be little or no volcanic activity.	On the north island there seems to be a narrow line of volcanoes parallel to and to the north-west of the narrow band of earthquakes. The mountains are volcanic in nature. On the south island there do not seem to be any volcanoes among the scattering of earthquakes.	There are deep earthquakes sprinkled within the earthquake pattern. On the north island the gradual pattern of deep to shallow earthquakes is present.	<ul style="list-style-type: none"> A few stato-volcanoes on North Island; only one shield Typically explosive eruptions

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Mount Etna	<ul style="list-style-type: none"> On an island next to Italy Sits close to Mt. Vesuvius Active for 2.5 million years; many people live at its base—lava moves very slowly so people can evacuate Old lava and ash make the soil very fertile Long geological history; probably started as an underwater volcano and rose above the surface Started as a submarine volcano and surfaced Lots of earthquake activity because of volcanoes 	<ul style="list-style-type: none"> Part of a large mountain range Located on an island off the coast of Italy 	Earthquakes are scattered over a broad area and mostly on land. There are multiple patterns within the regional area. The structure is near the plate boundary.	There are few volcanoes scattered in the region. There does seem to be a concentration along the west coast of Italy.	<p>Few volcanoes are scattered among the broad band of scattered earthquakes in the region.</p> <p>Mt. Etna is part of a large, broad mountain range though it is located on an island off the coast of Italy. Through Mt. Etna is volcanic not all mountains in the region are volcanic.</p>	Very few deep earthquakes and gradual pattern not present.	<ul style="list-style-type: none"> Cluster of strato-volcanoes around Mt. Etna Eruptions only affect the summit, rarely around the base Lava moves slowly Frequent ash and steam eruptions Was probably an underwater volcano that rose above the surface

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Mount Everest	<ul style="list-style-type: none"> Highest and largest range in the world Grows about 3 cm per year; forces push the mountains up Erodes away though –it is soft and weathers away.... Northern part of India Top of Mt. Everest was once the bottom of an ocean-fossil evidence Earthquakes and avalanches are common. The land is pushed upward Mountains create different climates and ecosystems 	<ul style="list-style-type: none"> Highest and largest mountain range in the world Flat plains on either side of the range. Large area of very high elevation which slopes rather quickly Wide mountain chain 	Earthquakes very scattered throughout a very broad band on land in the middle of a mountain range. They tend to go in a NW/SE direction. The structure is near the plate boundary.	There are very few volcanoes scattered throughout this region.	Few scattered volcanoes in a broad band of scattered earthquakes. Mt. Everest is part of a large, broad mountain range. Volcanoes and earthquakes happen on the land. Not all the mountains are volcanic. There seems to be one pattern in the region.	Very few deep earthquakes (all in one or two places)	No pattern; none of the volcanoes fit into any of the three categories selected
Mount Fuji	<ul style="list-style-type: none"> Lots of frequent EQ and volcano activity Steep under sea mountains with a trench near by Volcanoes can be dormant near active volcanoes Seismic Activity can be devastating here because of the dense population. Seismic activity off shore erodes the land 	<ul style="list-style-type: none"> Tall, steep and rugged volcanic mountains sitting next to a deep trench. Not a very high elevation Ocean gets very deep quickly 	One wide band of earthquakes that branches off in two directions. While there are earthquakes on both the island and in the water, there are many more along the south/eastern coast of Japan. The earthquakes fork off in a southern direction into the Pacific Ocean. The earth structure is near the plate boundary.	There are lots of volcanoes in this region. The volcanoes seem to follow several narrow lines.	A narrow line of volcanoes parallel to and to the west of a narrow band of earthquakes. Mt. Fuji is part of a narrow chain of steep volcanic islands and mountains that rise from a deep trench	There are deep earthquakes showing a pattern of shallow (east) to deep (west)	<ul style="list-style-type: none"> Mostly stratovolcanoes Dormant volcanoes surround active volcanoes

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Mount Kilimanjaro	<ul style="list-style-type: none"> Mt. Kilimanjaro is a volcanic mountain A rift--Land is splitting apart and cracking—land on either side are moving apart. Parts breaking off and moving off Waters from Indian Ocean may flood the valley Many volcanoes in the African Rift Valley Earthquakes happen often African Rift Valley has a lot of lakes that are warm and salty because of the geologic activity underneath 	<ul style="list-style-type: none"> Mt. Kilimanjaro is surrounded by plains that steeply decline in elevation at the gap in the middle of the rift Mt. Kilimanjaro has a gradual slope and is easy to climb Rift valley is splitting apart and cracking Rift Valley home to lots of lakes 	There is a narrow line of earthquakes in the northeast corner of the earth structure box. There seem to be very few scattered earthquakes in the region of Mt. Kilimanjaro. The earth structure is located near the plate boundary.	The volcanoes seem to be scattered throughout a narrow band with a line of volcanic activity running through it.	There is narrow line of lots of volcanoes with a scattering of earthquakes. This narrow line of volcanic mountains is fairly gradual in elevation change and mostly on land.	No deep earthquakes	<ul style="list-style-type: none"> Small cluster of shield, subtle chain of strato-volcanoes going north and south; many more volcanoes don't fall into one of the three listed types No recorded history of Mt. Kilimanjaro erupting
Mount Popo	<ul style="list-style-type: none"> Volcano is currently active—erupts steam frequently but the last big eruption in 9th century; only 20 minor eruptions have been recorded since Affects many people in surrounding areas 	<ul style="list-style-type: none"> Lots of mountains with a steep slope next to a flat plain Snow-capped and peak is 5,000 m above sea level Large crater 	Clear narrow band of earthquakes in a West to Southeast direction over the whole region. Most of the earthquakes in the narrow band are underwater along the coast next to the land. There are several scattered earthquakes radiating from the pattern. Mt. Popo is located near the plate boundary.	Near Mt. Popo there seems to be a scattering of few volcanoes in an East-West direction. In the south end of the region there is a narrow line of volcanoes that seem to follow the coast.	In the north region there seems to be a scattering of volcanoes parallel but not right next to a narrow band of earthquakes. In the south there is a narrow line of volcanoes to the northeast of a narrow band of lots of earthquakes. There are lots of steep volcanic mountains next to a flat plain in the north.	Deep earthquakes show a progression of shallow to deep; deep being on the continent side	<ul style="list-style-type: none"> Many strato-volcanoes along coast Mt. Popo has huge eruptions

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Mount St. Helens	<ul style="list-style-type: none"> In the middle of the Cascade (volcanic) mountain range EQ came before the volcano erupted in 1980. Volcano stores up energy -- earthquake caused the release of pressure Erupted more than lava—ash, rock, and debris violently Earthquakes are common Erupts occasionally rather than all the time like Kilauea 	<ul style="list-style-type: none"> Part of a large mountain range, slow slopes Medium size peak surrounded by plains 	Earthquakes are scattered on land. In the water they are concentrated in small narrow bands, sort of parallel to the coast. Further north in Canada the earthquakes are more scattered through the broad region. Mt. St. Helens is located near the plate boundary.	Inland there seems to be a line of volcanoes, but in the water there appears to be a scattering of volcanoes. In the north part of the region there seems to be volcanoes scattered throughout a wider band.	There is a volcano pattern parallel to the coast but not parallel to the scattering of earthquakes in the region nearest Mt. St. Helen. In Canada in the north part of this region there seems to be a narrow band of scattered volcanic activity. There also seems to be some linear patterns of earthquakes in the water with a scattering of volcanoes.	No deep earthquake pattern	<ul style="list-style-type: none"> Pattern of stratovolcanoes along coast; but there are also just as many shield and composite volcanoes Mt. St. Helens had a very explosive eruption
Mount Vesuvius	<ul style="list-style-type: none"> Massive explosion in 79 A.D.—quickly buried town in gas, rock and ash flows Hasn't had a major eruption in 1,000 years Lots of volcano related earthquakes Mt. Vesuvius is more deadly than Mt. Etna Affects population—people live there because of good farm land 	<ul style="list-style-type: none"> part of large mountain range located on Italy's mainland 	Earthquakes are scattered over a broad area and mostly on land. There are multiple patterns within the regional area. The earth structure is near the plate boundary.	There are few volcanoes scattered in this region. There does seem to be a concentration along the western coast of Italy.	Few volcanoes are scattered among the broad band of scattered earthquakes in the region. Mt. Vesuvius is part of a large, broad mountain range. Through Mt. Vesuvius is volcanic not all mountains in the region are volcanic.	Only a couple deep earthquakes showing no gradual pattern from deep to shallow earthquakes.	<ul style="list-style-type: none"> Cluster of strato-volcanoes Violent eruptions More dangerous than Mt. Etna—cause mudflows

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St. Helena Island	<ul style="list-style-type: none"> Tiny island in the middle of the Atlantic Ocean; no high mountains but has steep rocky cliffs Island is the top of a gigantic old volcano which extends deep into the ocean Volcano is dormant - hasn't erupted in 6 million years 	<ul style="list-style-type: none"> Little island in the middle of the ocean Ocean gets deeper west of the island and then shallow again—sort of in a line Top of tall ocean mountain 	Earthquakes are in a narrow line in a N/S direction. The pattern is west of the island and all are in the ocean. The earth structure is near but not right next to the plate boundary.	This region seems to have little or no volcanoes. Those that are there are scattered throughout the region.	There is a scattering of few volcanoes on either side of a narrow line of earthquakes. Near the earthquakes there is a narrow ridge of shallow underwater mountains. The mountains and islands in the region are all volcanic in nature though many are no longer active especially you get farther away from the earthquake pattern (rift).	A few deep earthquakes within the string of data but no gradual pattern from deep to shallow earthquakes.	<ul style="list-style-type: none"> No pattern